

INFORMAL DRAWING  
 Sheet 1 of 11

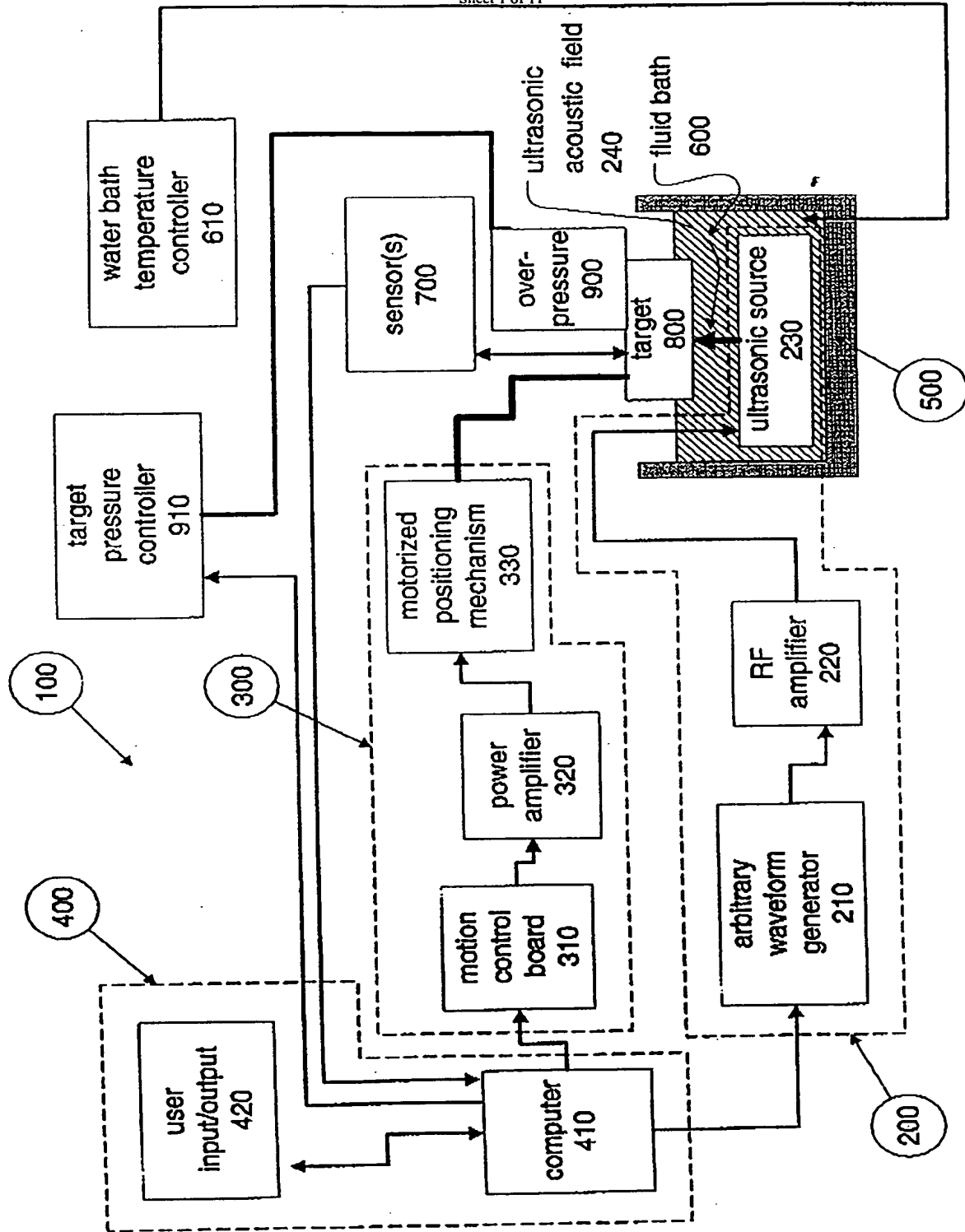


Figure 1

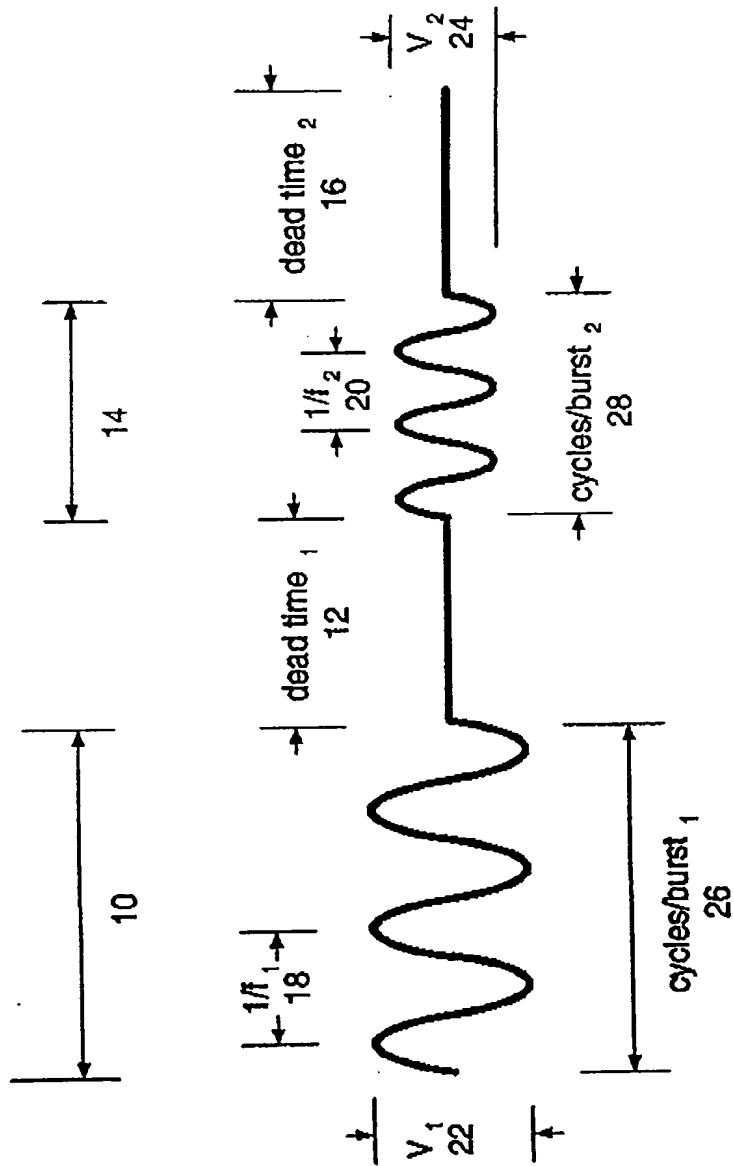
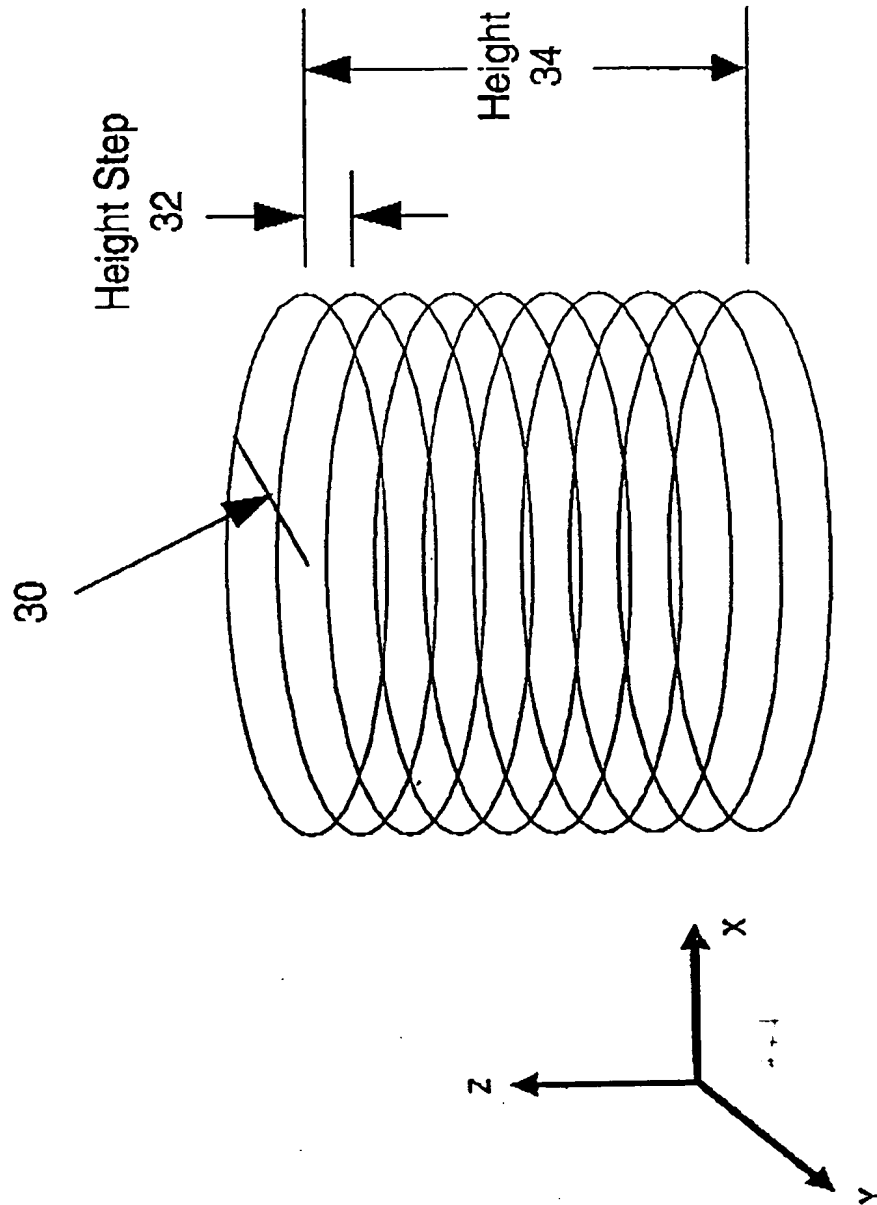
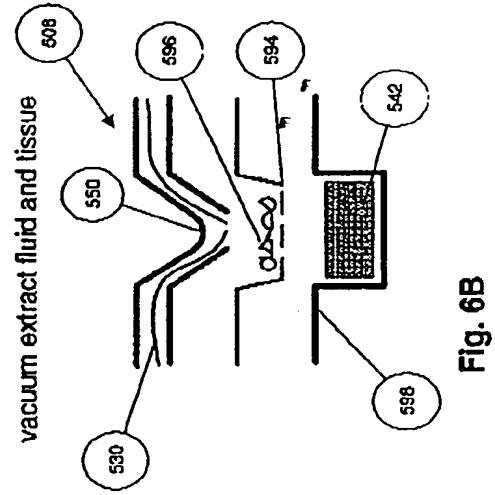
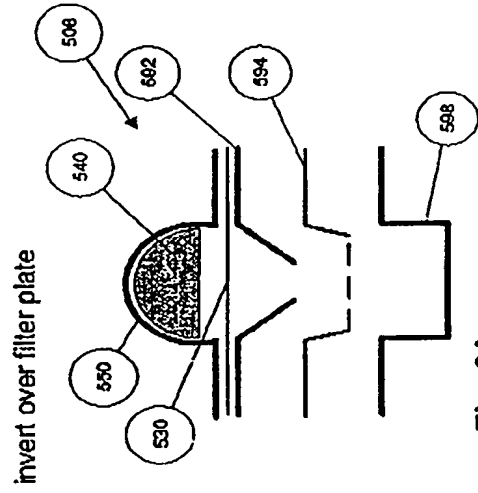


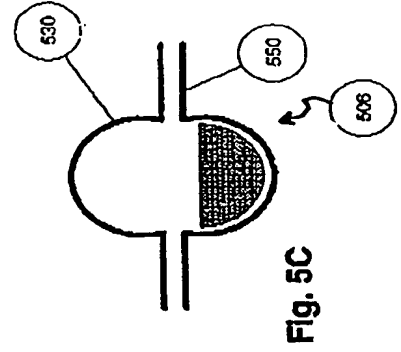
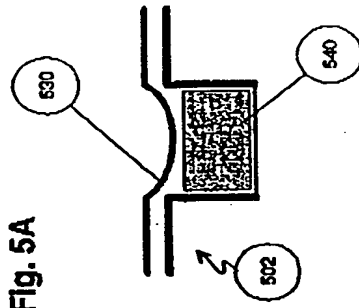
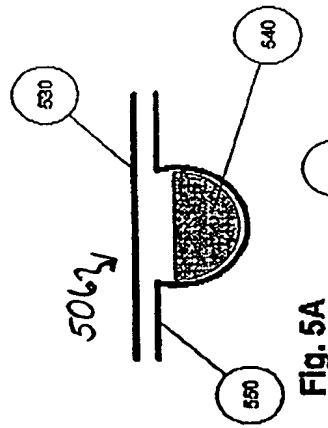
Figure 2



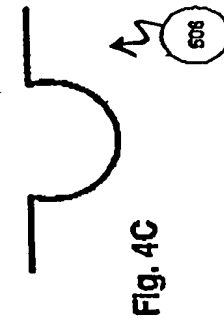
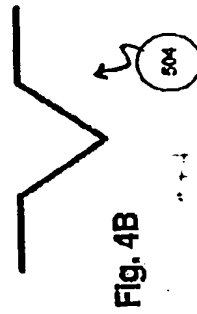
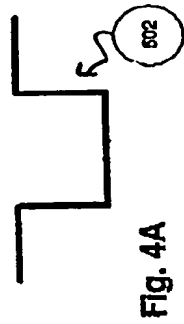
post-treatment  
transfer



pre-treatment  
assembly



treatment  
vessels



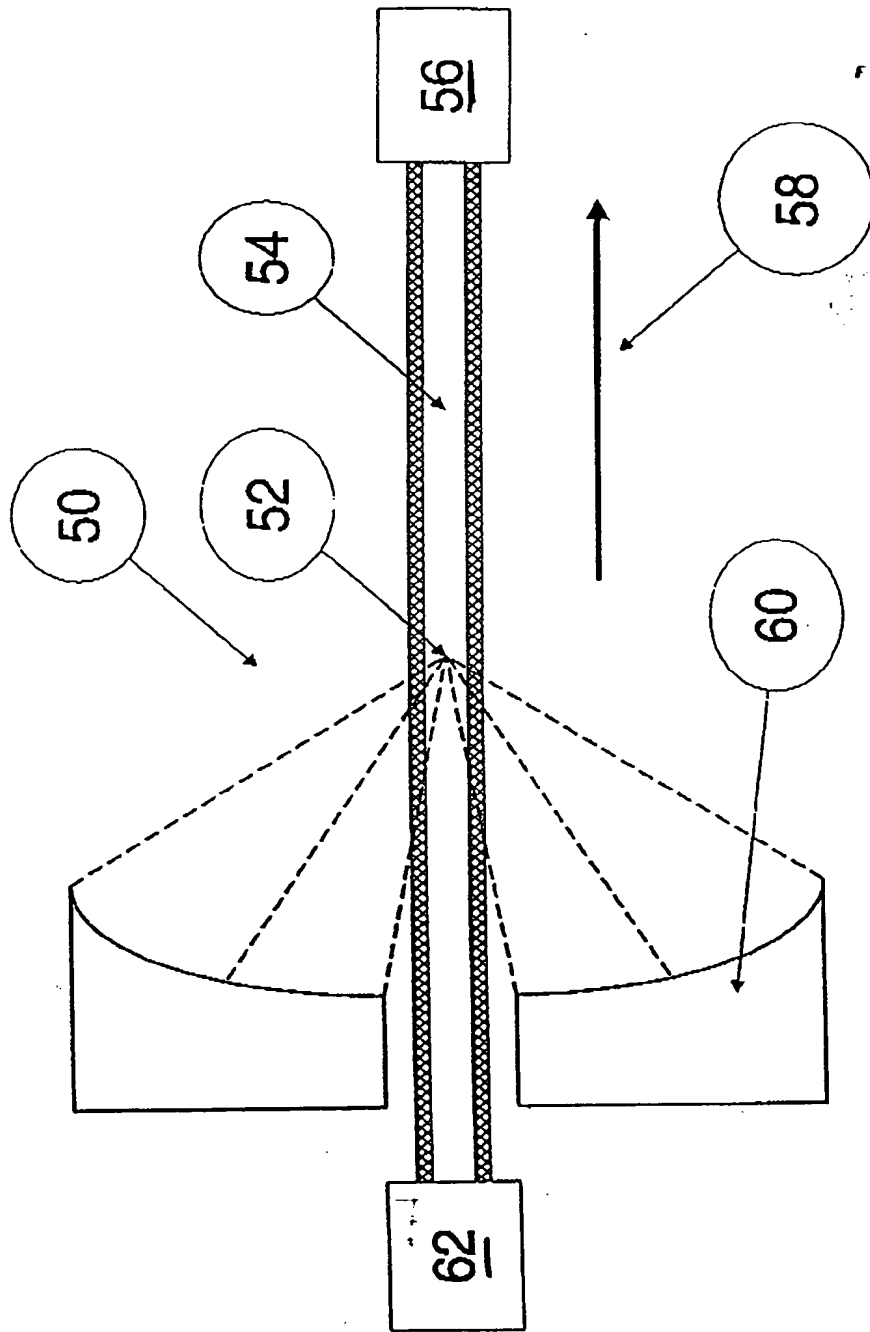


Figure 7

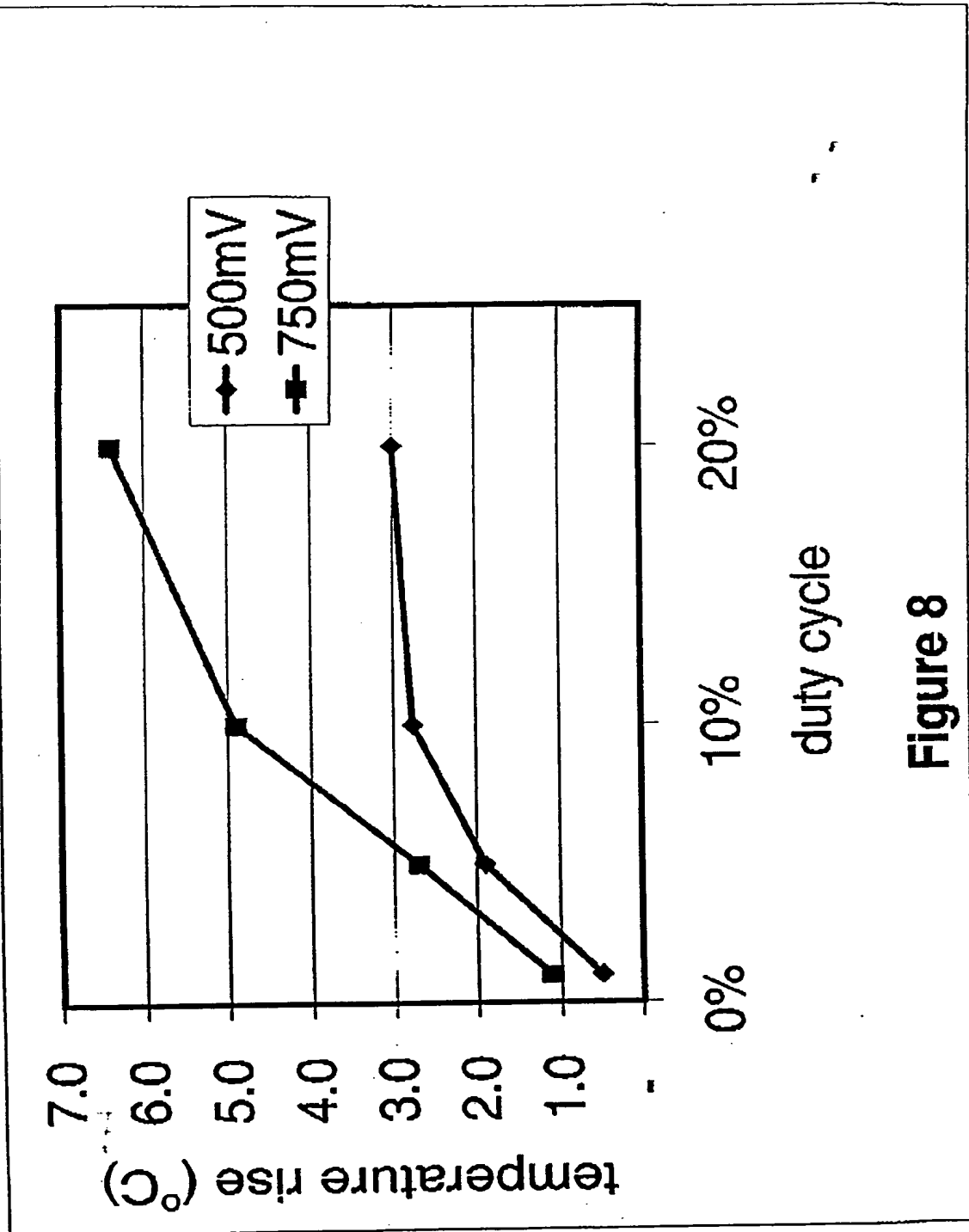


Figure 8

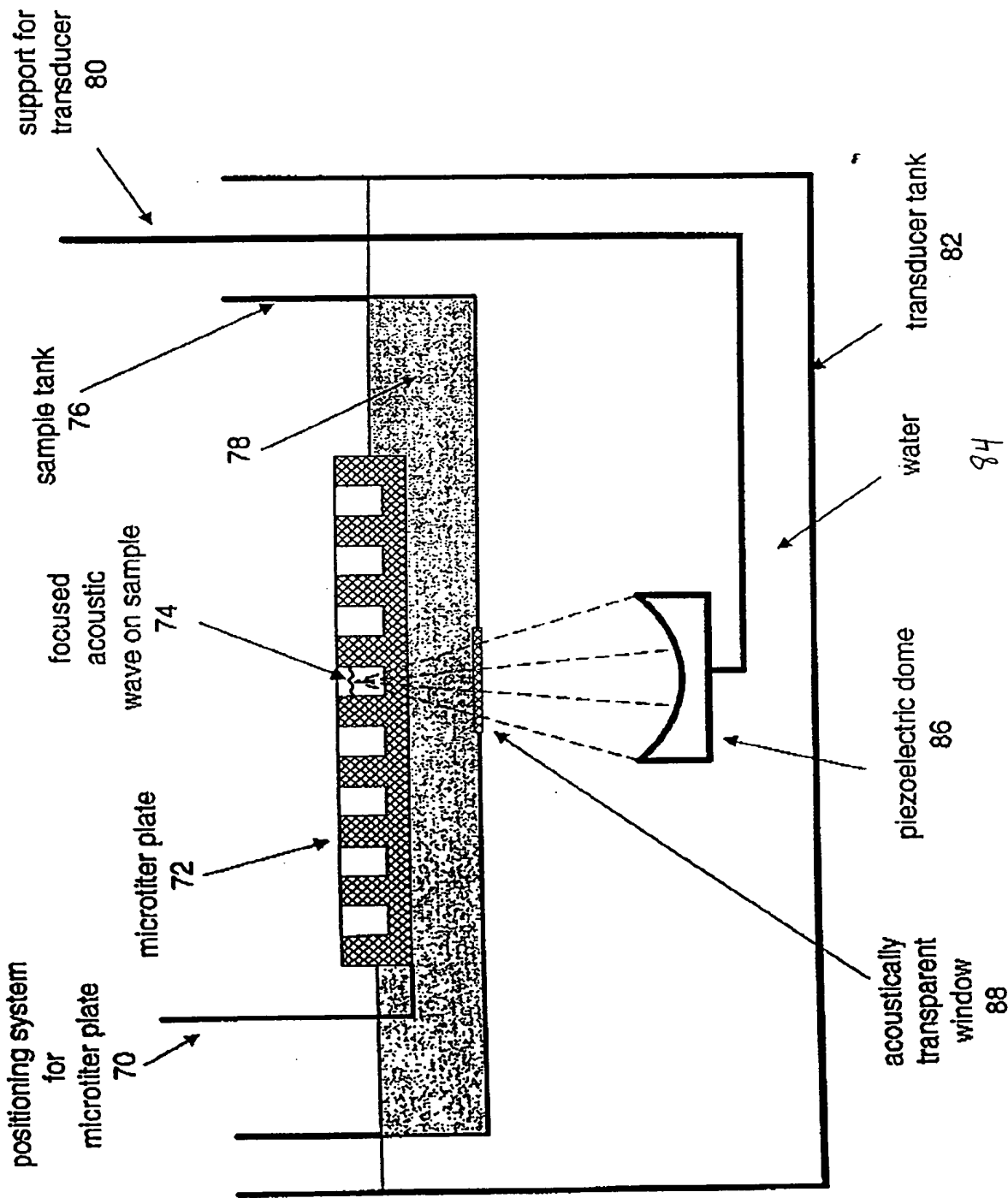


Figure 9

Figure 1b

SYSTEM SPECIFICATIONS	EXTRACTION	TRANSFORMATION	RESEARCH
PERFORMANCE:			
Format	microtiter	microtiter	variable
Treatment time	50 sec per well		variable
Temperature	+4 to +25C	+4 to +40C	-10 to +40C
	<4C	variable	variable
Acoustic parameters			
	1.1 MHz	1.1MHz	1.1,3.3MHz
Frequency			
Treatment profile			
Acoustic Waveform	shock	sine, shock	sine, shock
acoustic mask under plate			
	2 sec	2 sec	variable
	none	gas, overpressure	gas, overpressure
Traverse time between samples			
Atmosphere Control			
CONSUMABLE:			
	96well PCR plate, off-the-shelf	24 well plate	variable
Format	200ul standard. Other options	variable	single and multi
Volume	yes	yes	optional
single use?	optional	yes	
Sterile			
PROCEDURE:			
	transfer to plate	aliquot cell culture into plate	
	add fluid	treat at controlled temperature	
	heat seal plate	transfer to growth medium	
	store at -80C		
	treat at +4C		
	place on vacuum fixture		
	vacuum transfer to microtiter		
	option: filter at transfer		
MECHANICAL:			
Format			
Water Bath			
	benchtop plus half-rack and chiller	benchtop plus half rack	cart plus rack
	1 gal distilled water	1 gal distilled water	15 gal
	Water volume		
	temperature control		
	circulation pump		
	degassing system		

Figure 11

SYSTEM SPECIFICATIONS	EXTRACTION	TRANSFORMATION	RESEARCH
INSTRUMENT CONTROL: LabVIEW			
x-y-z positioning (sample)	yes	yes	yes
z' axis (transducer)	manual, 25mm range	manual, optional auto	manual
Temperature feedback to protocol	yes	yes	yes
partial treatments	yes	optional	no
cavitation detection			yes
video detection and analysis	no	optional	yes
USER INTERFACE: LabVIEW			
treatment protocol	fixed	user adjustable	flexible
select treatment positions	pre addressed	user adjustable	flexible
temperature profile record	optional	yes	yes
timing information	yes	yes	yes
ELECTRICAL:			
Power: 110V, 20A			
EQUIPMENT:			
Chiller	yes	no	yes
RF Amplifier	yes	yes	yes
Arbitrary waveform generator	yes	yes	yes
oscilloscope	no	optional	yes
Computer	yes	yes	yes
motion control	yes	yes	yes
I/o boards			
amplifier			
xy stage			
IR temperature measurement	yes	yes	yes
video	no	optional	yes
laser sight/cross-hairs	yes	yes	yes
vacuum fixture	yes	no	no
Transducer			
matching network			
cables			
circulation pump			
convection cooling			
filter			
cavitation detection	no	optional	yes

Figure 12

INFORMAL DRAWING  
Sheet 10 of 11

LabVIEW PROGRAMMING TASKS

GENERAL

	Extraction	Transformation
display revision level	x	x
safety interlocks	x	x
time and date stamp		x
STOP function	x	x
save configuration to file	user can reset defaults	x
operating parameters		x
protocol		x
save data to file		
treatment positions and protocols		x
temperature profile		x
error conditions		x
password protection on Vis	x	x
load configuration from file		x
user selects treatment positions	x	x

DISPLAY

User selectable treatment positions -graphical	x	x
current status		
treatment position -graphical	x	x
current protocol	by name	x
-voltage		x
-duty cycle		x
-etc		x
time to finish current sample	x	x
safety interlock status	x	x
sample temperature, graph and current temp		x
time and date		x

ULTRASONICS

initialize instrument(s)	x	x
stop function	x	x
mix and treat	predetermined	user-programmable
frequency	predetermined	x
voltage-treat	predetermined	x
voltage-mix		x
pulselength-treat	predetermined	x
pulselength-mix		x
deadtime-mix>treat		x
deadtime-treat>mix		x
Total cycles (or time)	predetermined	x
cavitation detection		optional

POSITIONING

setup and diagnostics		
initialize stepper control board	x	x
calibrate (home)	x	x
check limits (limit switches)	x	x

## LabView PROGRAMMING TASKS

POSITIONING	Extraction	Transformation
setup and diagnostics		
program sample positions	predetermined	predetermined
program dithering	predetermined	x
operation		
select sample format	predetermined	
select treatment positions	predetermined	x
select treatment for each position	x	x
select dithering profile	on/off only	x
stop at limits	x	x
TEMPERATURE		
measure temperature		x
display temperature		
momentary		x
graph		x
record temperature		x
current temperature		x
record min/max		optional
save to file		optional
manage process based on temperature		
pause process to cool		
modify process		
go to next well at set temperature rise		

Figure 13